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ABSTRACT

Hearing impaired adolescents were administered one of four tests of syntax in preposition usage. Results indicated a clear developmental sequence: generally prepositions are first acquired in locative phrases, then as temporals, and then as manner relationships. The acquisition process is detailed. The author concludes that the complexity and subtlety of meaning exhibited by individual prepositions present the biggest obstacle to the hearing impaired rather than the syntactic complexity of the structures. (CL)

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The Ability of Hearing Impaired Children to Comprehend the Semantics of English Prepositions

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Paper presented at the Fourth Annual Boston University Conference on Language Development

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Introduction

In two recent papers, (Kluwin, 1978, 1979), I argued, first, that semantic criteria as well as syntactic criteria must be used in the assessment of the language development of deaf adolescents, and second, that while previous writers had seen the problem of preposition usage in deaf children as one of syntactic deletion of the preposition in appropriate positions, the semantics of the English preposition system would explain more of the phenomenon. I proposed a sequence that would describe the development of preposition usage, assuming that my sample represented a developmental sequence and not different groups.

The first stage is the use of verbs which contain a semantic feature that makes the preposition semantically redundant but structurally necessary. The second stage is the acquisition of the function of the preposition. Apparently, the first prepositions to be acquired are the locatives: "at, in, on, to, from" and the manner or partitive prepositions: "with, about, for." Although the child at this level has acquired the syntactic rule of using prepositions, the child has still not developed all the semantic features for the system nor a full set of prepositions. Simple proximity between words as well as verbal meanings are still used to carry some relationships. The child exhibits some redundancy in the use of prepositions after verbs. The third stage is the use of a somewhat expanded prepositional system but with increased use of redundant prepositions. In this case, some idiosyncratic prepositions may appear as the result of special experiences such as training programs. Concurrent with this is increasing sentence length. A few specifications have been added to the locatives, but the system is still

in free variation for some meanings. The fourth stage is the elimination of the redundant prepositions except for a few outstanding cases, e.g., "look like" for "look." There is an increase in the total number of prepositions and a stabilization of locative meanings, but there are some special usages that are still incorrect.

Test Development

Based on this previous work, approximately ninety categories of preposition meanings occurring in simple prepositional phrases were generated, This was subsequently reduced through an elimination of apparent redundancies or the low frequency of occurrence of a particular structure. Sixty sets of prepositional meanings were finally generated.

Items were generated for the test by selecting three possible distractor prepositions including the total absence of a preposition and inserting the distractors into the same syntactic position as the target preposition. Response patterns were then randomly assigned for each of the 180 test questions. The test taken by each individual was a 45 item multiple choice test produced by creating four random combinations of items. Examples of some test items are presented below.

Sample Items:

Example 1

1. Mary walked the store.
2. Mary walked at the store.
3. Mary walked on the store
4. Mary walked to the store.

Example 2

1. The movie comes among the cartoon.

2. The movie comes above the cartoon.

3. The movie comes the cartoon.

4. The movie comes after the cartoon.

One problem with the construction of the test was that it was desirable to have items that were close in meaning to the target item as based on earlier work (Kluwin, 1978), but it became quickly apparent that such prepositions in the absence of an extended context were interchangeable with the target prepositions within a particular environment. For example, while it would be desirable to discriminate between the locative meanings of "in, at, to" and "on", it was not possible because such prepositions in their general locative meanings are easily interchangeable within similar environments.

For example:

1. John is in the house

2. John is at the house.

*3. John is to the house.

4. John is on the house.

This particular problem may introduce some bias in the responses to the test items. Since it was often necessary to select quite distinct distractor prepositions in some cases, it is possible that some of the responses may be predisposed in a particular direction.

Sample

One of the four 45 item tests was randomly given to each of 206 hearing impaired adolescents. Descriptive information on the sample is provided in Table 1.

Table 1

Age, Sex and Reading Level of Sample

		Test A	Test B	Test C	Test D	Total
N		54	56	51	45	206
Age	mean	16.8	16.2	16.6	16.6	16.5
	s.d.	1.8	2.1	2.0	1.9	1.9
Sex	male	31	27	24	18	100
	female	23	29	27	24	106
Reading Level (GES)	mean	3.99	4.12	4.06	4.25	4.10
	s.d.	2.26	2.50	2.29	2.31	2.33

General performance for the four groups on the four different tests was reasonably similar. Mean group scores for each test were very close with the exception of Test A which was slightly lower than the others. Descriptive information on overall test performance is provided in Table 2.

Table 2

Means, Standard Deviations, and Reliability Coefficients for Tests

	Test A	Test B	Test C	Test D
N	54	56	51	45
mean	25.185	28.875	27.333	28.000
s.d.	8.830	10.352	10.301	9.424
s.e.	1.202	1.383	1.442	1.405
alpha	.896	.928	.929	.914

The high reliability of the four separate tests suggests that individual item performance should also be good. This was generally the case with a few exceptions.

Test Results

Table 3 represents the concepts tested for in the four tests arranged on two axes. They are arranged vertically in terms of the difficulty of the items. They are arranged horizontally in terms of the reliability of the items used. The easiest and most reliably measured construct was "On 1 p." The most difficult and least reliable construct measured was "Of 6." Descriptions of the items are provided in Appendix 1.

Table 3

Test of Preposition Usage

Concept Acquisition

On 1 p		
In 2 p	On 4 p	At 1 c
For 2 m	After 1 t	To 1 p
	With 2	
	To 2 p	
From 1 p	At 1 p	In 1 m
After 2 t	Of 5	Behind 1
	At 2 p	In 1 p
	With 3	
	During	
	Around 1	Off 1
With 1	Of 1	On 3 m
Of 7		On 2 p
Of 4	After Seq.	
	At 5 p	
	By 1	
Around 2	In 3 t	
Of 8		
At 4 p	Of 2	
	To 3 m	
	From 2 p	
	By 2	
In 2 t		
Instead of	Against 1	
On 2 m	For 2 t	
	Without 1	Off 2
	To 2 m	
In 2 m	At 3 p	
For 3 m	Against 2	In 1 t
	To 1 m	On 3 p
		Of 3
		In 3 m
		Of 6

Legend:

m = manner
p = locative
t = temporal

Discussion

Over the entire set of test results, a clear developmental sequence is apparent as can be seen in Table 3. Generally, prepositions are first acquired in locative phrases, then as temporals, and then as manner relationships. Specialized prepositional meanings are acquired within this structure, but due to the small amount of information available both in terms of the number of different preposition meanings tested for and the limitations of the types of environments used, it is not possible to account for these types of acquisitions.

Before proceeding further, it might be useful to distinguish briefly, the use of the terms "locative", "temporal", and "manner" as they would be applied to the following sentences:

5. I live in a house.

6. I work best in the morning.

7. I am in the school play.

Since all three verbs are intransitive, it is clear that the restriction that the verb applies is not necessarily syntactic in nature but can be primarily semantic. It is also apparent from the examples that the syntactic structure of the prepositional objects are similar. What results primarily in their categorization as locative or temporal or manner phrases is a semantic specification of the prepositional object. "House" clearly contains a specification of locale and "morning" involves some measure of time. Manner relationships are a "catch-all" category for those phrases that do not clearly fit into locative or temporal categories but imply some condition or situation. The same

system would operate for "on".

8. I am on the roof.

9. I will arrive on Thursday.

10. The house is on fire.

While a complete description of the semantics and sequence of acquisition of every preposition would be interesting and quite useful, time, space, and the complexity of such a system preclude any such discussion (Leech, 1969). To illustrate the acquisition sequence, two topics will be discussed. The first is the similarity between time and space relations in English. Second, there will be a brief discussion of the relationships involved in the use of "of".

Two examples will illustrate the first point to be made about the relationship of time and place prepositions in English.

11. I will arrive at 6 a.m. on a Thursday in June.

12. I will be at my home on State Street in Chicago.

In both examples the progression of the relationships is similar: point/moment, locale/day, dimension/month. Both time and space in English are treated as one, two, and three dimensional phenomenon and the same prepositions are used to specify the succesion of relationships (Leech 1969; Konig, 1974). "At" contains the basic feature of +position and relates time or space as a one dimensional phenomenon. "In" has the primary features of +position and +relative. "On" relates concepts involving a two dimensional phenomenon: plane surfaces or medial units of time. "In" has the basic specification of +position and the further specification of dimensionality. Months contain weeks or days, but days are divisible only as hours. If we wish to speak of seconds or minutes

in English, we either deal with it as a continuous duration:

13. The bomb will go off in thirty seconds,

or we use them to further define a point in time expressed as an hour;

14. At 6:16 a.m.

The close relationship of temporal and locative prepositions in English accounts for the earlier acquisition of these prepositions by hearing impaired children. Locatives which clearly involve physical, perceptible relationships are acquired first. Temporals are then built onto the lexical items that are already established within the vocabulary by the locatives.

In an earlier paper I discussed the relational system of the English locative prepositions (Kluwin, 1978). The basic argument of that paper was that the locatives have some base meanings, but the varied meanings of the prepositions tend to overlap producing problems for hearing impaired children. The results of these tests support a similar picture.

Within the set of locative prepositions, "on" is the predominant meaning followed by "in" and "to" and finally by "at". More specific locative prepositions are acquired with this basic group but at a later stage. "Behind", "around", and "from" are acquired later. The reason for this is that "in, at, to, on" have relatively simple base meanings. "To" has a generalized meaning of +motion and +direction; "in" has a basic +position and +dimensionality meaning; "at" contains the feature +position; while "on" has the basic features of +position and +relative. "To" assumes the +position feature. "Behind, around, from, off" all share the same basic set of features as the four primary locative prepositions but require additional specifications. "Behind requires

the features of +position and +relative like "on" but the +relative feature itself requires further specification. For example, a shirt that is "on the chair" could be on the seat of the chair or the arm or the back, but a shirt that is "behind the chair" would describe a more limited set of physical relationships. "Around" presents a problem in acquisition since one of its meanings can be ambiguous. As used in the test, "around" indicated either circular motion or circuitous motion. "Around" has the same basic features as "to" that is +motion and +direction but the +direction feature can either be a continuous direction as in:

15. We will go around the mulberry bush,

or it can indicate a change of direction as in;

16. We must go around the mulberry bush to avoid the quicksand.

"From" was acquired earlier than some of the meanings of the basic group of "in, at, to, on" because it is less complex semantically than some of the alternate meanings of those prepositions. As a locative it was only used in the very general sense of motion away from a point. This made it the opposite of "to". Test results indicate that it is acquired just after "to".

While temporals do pattern along the same conceptual lines as the locatives, it is necessary to differentiate within the temporal system using quite a different kind of system. Table 4 below presents the temporal prepositions tested for as well as the specifications that are required to differentiate the group. The specifications are not to be considered as comprehensive since Leech (1964) finds it necessary to employ four different types of taxonomic systems for a complete specification and this presentation is only a series of binary contrasts.

Table 4

Contrastive Feature Analysis for Temporal Prepositions

	At 1	After 1	After 2	During	For 1	For 2	In 1	In 2	In 3
Period	X	X		X	X		X	X	X
Segmentable					X			X	
Continuous				X			X		
Caldendrical	X						X	X	X
Repetition			X			X			
Precedence		X	X						

The major distinction within the temporal system is the difference between +period and +repetition. Time can be considered either as a measure of duration or as a measure of sequence. Within the categorization of time as a duration or +period, the important distinctions are +segmentable or a time expression that can have a cardinal number in front of it; +continuous versus time as a discrete point and; +calendrical or the use of specific measure of time. The first feature within the categorization of time as sequence is +precedence or simply ordering from lowest to highest or vice versa.

The acquisition sequence follows Table 4 in the sense that an increasing number of specifications is related to the later acquisition of the item. The first temporals to be acquired are "at" which is the single dimensional time preposition and "after" when it implies a point

in time. The next temporal preposition to be acquired is the sequential meaning of "after". The third major category of temporal prepositions are a group related to "during" which involve the notion of ongoing time. "During" is the first to be acquired of this group and the rest follow in relation to the number of specifications required to distinguish them from each other. The one exception to a neat order of acquisition may prove to be a regular rule. Usually a more complex syntactic or morphological feature within the prepositional phrase will delay its acquisition. The acquisition of "for 2" which requires an ordinal adjective may be a result of this.

The second set of prepositions that is illustrative of general patterns of acquisition is "of." "Of", as tested for, presents three basic meaning groups and needs to be discussed within these three groupings. The common structure for the use of "of" in the tests was that of NP of NP. Three possible relationships exist between the NP's. If the first NP is called A and the second B, the following three relationships exist.

(1) A (B) B is predicated of A. mother of John

(2) (A) B A is predicated of B. glass of water

(3) A< B A is a subset of B. some of us

In the first case, a transformation will change the relative position of noun phrases A and B by eliminating the preposition and changing B into a possessive as in "John's mother". It is also possible to demonstrate that the A noun phrase is the primary one by performing this transformation and then deleting one or the other of the noun phrases from a simple sentence.

17. The mother of John is sick.

18. John's mother is sick.

19. John is sick.

20. Mother is sick.

The first, second, and fourth sentences of the above group clearly form a set while the third one is not necessarily related to the other three. This demonstrates that the primary noun phrase is the A phrase.

The second set of "of" meanings involve situations where the A noun phrase is predicated of the B noun phrase. In these cases, it is not possible to use the transformation to convert the prepositional phrase into a noun phrase containing a possessive, e.g., "water's glass" The primacy of the B noun phrase can be demonstrated in a slightly different environment from the previous meaning group since the possessive transformation cannot be used.

21. I want a glass of water.

22. I want a glass.

23. I want some water.

While arguments could be made for underlying intent, it is reasonable to consider sentences 21 and 23 to form similar types of requests. The primary point of the communication is the desire for the object of the preposition, and the container is irrelevant.

The third meaning category for "of" is the situation where the A noun phrase is a subset of the B noun phrase in "some of us" or "the best of us". Several different situations are included in this category such as the use of comparative adjectives with a prepositional phrase as in "the slowest of the slow" or the indication of an examplar as in "John is one of them." In these examples, it is not possible to apply

the possessive transformation nor is it as clear whether noun phrase A or noun phrase B is of primary importance.

24. Some of us are here.

25. We are here.

26. Some are here.

The three sentences are not as clearly distinguishable as the other sets. In these sentences, the predication relationship is not as well established.

In the sequence of the acquisition of prepositional meanings, those meanings involving clear predication relationships were generally acquired before the subset relationships. Since the subset relationships are almost redundant in the sense that it is difficult to distinguish between the primary element in the noun phrase relationship, these would be less likely to be acquired than prepositional meanings where the relationship was extremely clear. There was no clear distinction made between the acquisition of phrases where the A phrase was predicated of the B or vice versa. Since there was only a single instance of the A phrase being predicated of the B, it is difficult to argue for any kind of particular acquisition sequence. A possible subcategorization may account for the acquisition of meanings within the first set of meanings which involve the predication of the B phrase of the A. The noun in each phrase can be categorized as animate or inanimate. With such a categorization, the acquisition sequence can be described in the following way. +Animate phrases are acquired first and A phrase animacy is more important than B phrase animacy. The developmental sequence was:

Preposition:	Example:	Phrase A:	Phrase B:
Of 5	mother of John	animate	animate
Of 7	director of the division	animate	inanimate
Of 8	picture of Mary	inanimate	animate
Of 6	a friend of mine	animate	animate

Of 6 is an exception to the sequence because it contains an additional grammatical specification: the use of a possessive form in the B phrase. The use of additional grammatical features regularly lowers the likelihood of acquisition.

For the acquisition of "of", three principles seemed to be functioning: first, the clarity of the predication relationship; second, the concreteness of animacy of the noun phrases; third, the use of additional grammatical specifications within one or the other of the noun phrases.

Conclusion

What will thwart the acquisition of prepositions for the hearing impaired child is not necessarily the syntactic complexity of the structures although that is clearly a component. The nemesis for the hearing impaired child is the complexity and subtlety of meanings that individual prepositions will exhibit. What is needed both for instruction and for testing is the concept of a spiral or a sequence of form acquisition rather than considering the mastery of a preposition in a basic meaning environment as the end of the road. The results of the study reported here suggest strongly that a general developmental trend

exists. It is likely that further work will clarify the sequence more, but some useful general principles can be stated. First, prepositions are acquired first in locative phrases, then in temporal phrases, and finally in phrases involving manner relationships. Second, preposition meanings are acquired from their most generalized meaning within a category to more restricted meanings. Third, increasing syntactic or morphological complexity within the simple prepositional phrase delays the acquisition of a prepositional meaning.

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APPENDIX 1

TEST SPECIFICATIONS

"AGAINST" used in a locative sense.

1. expressing motion and opposition

   The waves beat against the ship.

2. indicating relative position and contact

   The gun was leaning against the door.

"AFTER" used in temporal phrases.

1. to define time after a specific point

   I am not allowed outside after dark.

2. to describe a recurrent pattern

   We sailed the Pacific week after week (mile after mile).

"AROUND" in locative phrases

1. indicating circular motion

   We will go around the track again.

2. to indicate an indirect route

   You must go around the town because of the storm.

"AT" used as a temporal

1. Referring to a specific point in time

   I get up at 6 a.m. every morning.

"AT" used in a locative sense

1. used to show relative position in space indicating a point

   We'll meet at my house.

2. positioned in relation to a three dimensional object

   He was standing at his desk.

3. meaning participation in a function or activity

   George is at school.

4. meaning a street address

   I live at 4716 S. 29th.

5. indicating motion towards, often with an additional meaning of opposition

We ran at the door.

"BEHIND" used in locative phrases

1. to describe a point after another point

The girl walked behind the teacher.

"BY" in manner relationships

1. meaning to use an object or by means of

We will travel by car.

2. use of object's parts or characteristics to manipulate it

The cop caught the crook by the arm.

3. meaning because of

I came here by mistake.

"DURING" used in temporal phrases for continuous duration

I do not dream during sleep.

"FOR" used as a temporal

1. used to express continuous duration

We worked on that project for days.

2. used for repeated actions

The raiders came for the third time.

"FOR" used in manner relationship

1. to indicate causality or reason

We are still in debt for the treatments.

2. to indicate possession or reception

This book is for you.

3. to indicate purpose, cause or source

We are fighting for a free Transylvania.

"FROM" used as a locative

1. meaning a direction away from a point

   The ships sailed from France.

2. used with "to" to indicate a sequence

   The squirrel leapt from branch to branch

"IN" used in a locative sense

1. used for a place or position implying limits

   We live in houses.

2. before the proper names of continents, seas, etc.

   John lives in America.

"IN" used as temporal

1. referring to a specific month

   The wagon train will arrive in August.

2. used to express a duration from start to finish

   I learned French in two weeks.

3. used for a continuous duration

   I work best in the morning.

"IN" used in manner relationships

1. to indicate cooperation or participation in or the object of a psychic state

   We are in sympathy with the prisoners.

2. to indicate participation or cooperation in a physical activity

   I am in the school play.

3. to indicate participation in a collection without a personal pronoun

   The animals came to the ark in pairs.

"INSTEAD OF" indicating a replacement for

John will go instead of me.

"LIKE" used for manner phrases to indicate resemblance to

John is running around like a madman.

"OF" used in possessive or relational phrases

1. following a word of quantity

   a glass of water, a group of people

2. used to indicate a larger quantity or whole

   some of us, everyone of us

3. used with a comparative or superlative

   the best of us, the poorer of the two

4. used to indicate an example of a class or group

   John is one of them.

5. used in kinship or human relationship expression

   Mary is the son of Bruce; the friend of John

6. preceding a possessive noun

   a friend of mine, a brother of Larry's

7. used for ownership or possession

   director of the division, owner of the ranch

8. meaning representing or showing

   a picture of Mary, a likeness of Laverne

"OFF" used in locative phrases

1. indicating separation from or losing contact with

   The leg has fallen off that chair.

"ON" used as a locative

1. meaning covering an object

   The drape was on the chair.

2. meaning above and in contact with

He was lying on the floor.

3. indicating contact with a non-horizontal surface

The picture was on the wall.

4. indicating position in relation to a place or thing

John was on the other side of the road.

"ON" used in manner relationship

1. introducing a state, condition, or action

The house is on fire.

2. introducing the result of an action

You spend too much on cigarettes.

3. meaning fastened to

Keep that dog on a short leash.

"TO" used in a locative sense

1. indicating motion in the direction of a point

He went to the post office.

2. meaning as far as or some distance

It is a long way to the village.

"TO" used in a manner relationship

1. indicating a value reached

Your bill amounts to $300.

The temperature never rises to the boiling point.

2. as the link between attachments and their objects.

He tied the flag to the stick.

We are attaching you to the new director's office.

3. "to" or "into" to introduce a state that is the result of a process

The snow turned into water.

The magician was transformed into a horse.

"WITH" used in phrases implying inclusion

1. showing opposition

   Don't fight with those boys.

2. meaning in the company of

   John has run away with Mrs. Cummings.

3. used with the transportation of an inanimate object

   John Wayne always goes with a gun on his hip.

"WITHOUT"

1. meaning a lack of

   I came without my umbrella.